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# Head-Up Display

**Model: E63/64**

**Production: Start of Production MY 2004**

# OBJECTIVES

After completion of this module you will be able to:

- List the advantages of the HUD
- Name the components of the HUD
- Explain HUD operation
- Perform HUD self test
- Align HUD with special tools

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## Head-Up Display

The HUD projects a virtual image into the driver's field of vision.

Depending on the equipment installed in the vehicle, this virtual image contains information that is of relevance to the driver, such as e.g.:

- Cruise control FGR
- Active Cruise Control ACC
- Navigation
- Check Control messages
- Road speed



The size of the virtual image is approx. 200 mm x 100 mm.

### Advantages of the Head-Up Display

The virtual image in the driver's field of vision allows the driver to concentrate more on the road ahead than previously. Driving is thus rendered less fatiguing. The driver switches his vision between e.g. the instrument cluster and road traffic less frequently.

### Components

The HUD is made up of the following components:

- Cover glass
- Mirror
- LED power supply
- LED array
- Light well
- TFT projection display
- Shutter
- Main board
- Secondary board
- Housing

Additionally required components:

- Windscreen
- Light Module
- Rain/light sensor
- Safety and information module

## Control Elements

- HUDs control buttons and light switch
- Instrument-lighting dimmer
- Controller

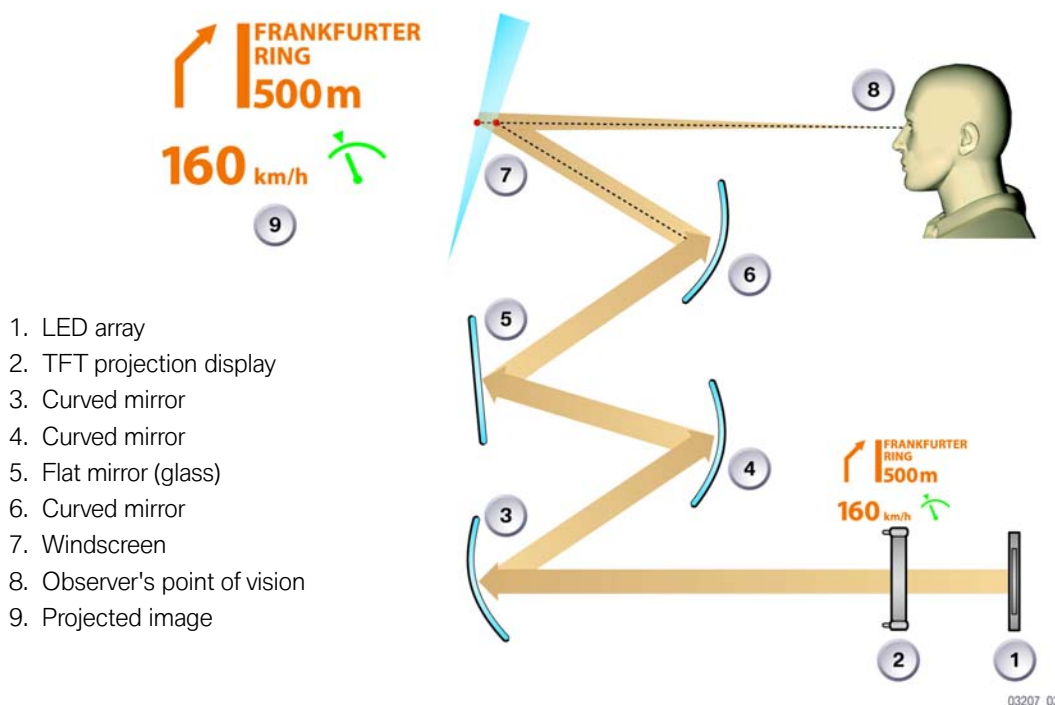
## Image Sources

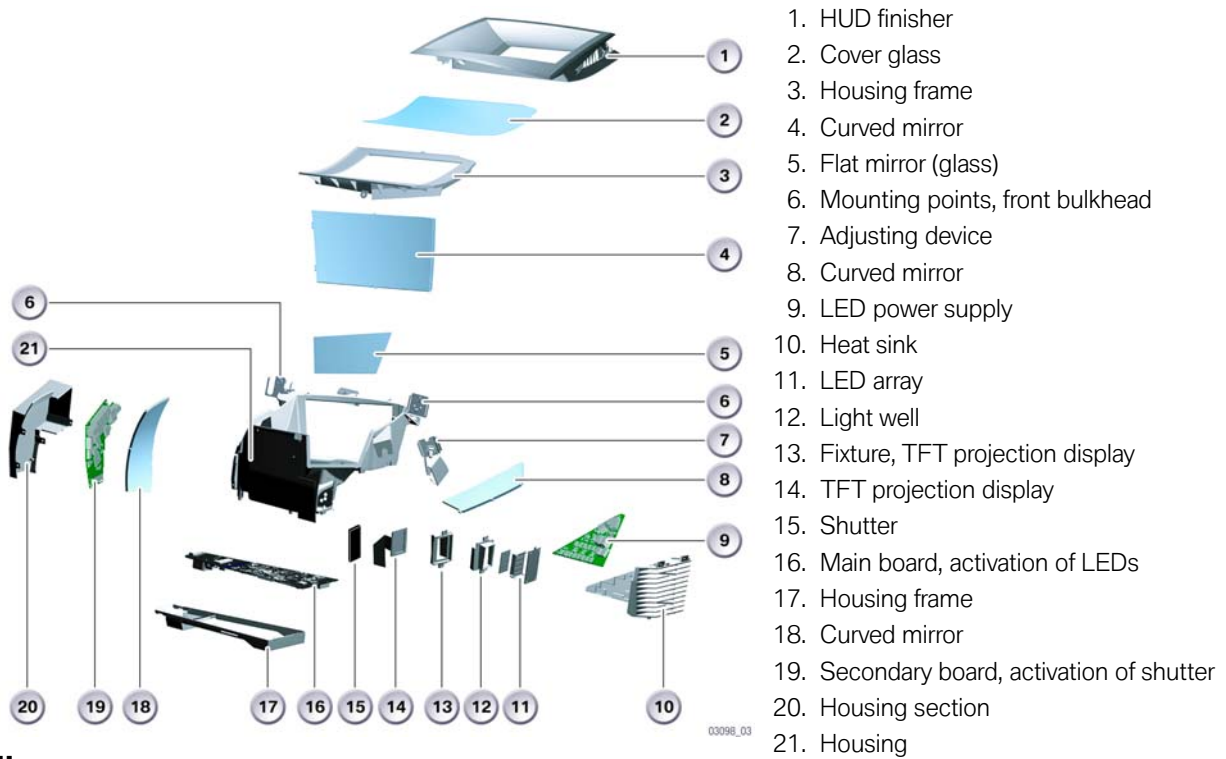
The following control units supply the necessary signals for the displays:

- Active cruise control ACC
- Car Communication Computer CCC
- Instrument cluster KOMBI
- Steering column switch cluster SZL
- Digital motor electronics DME

## Functional Description

The HUD can be compared to a projection device. An LED field is required as the light source for the purpose of projecting the HUD information. The image content is created by the TFT projection display. The TFT projection display can be compared to a filter which admits or blocks light. An optical imaging element determines the shape and size of the HUD images. The image is projected onto the windscreen and appears freely suspended over the road surface.





**Mirror**

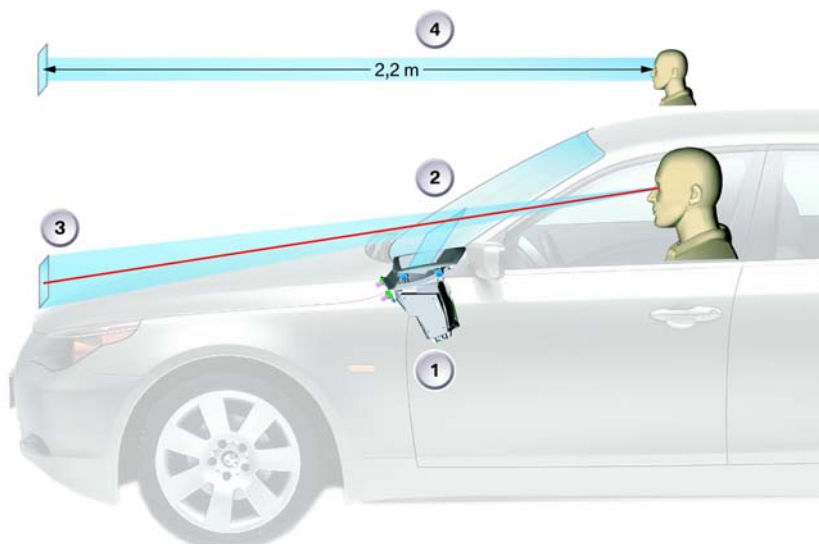
The HUD incorporates four mirrors. These mirrors reflect the display content onto the windscreen. Three of the mirrors are curved. These mirrors adapt the display content to the screen.

This mirror determines the size and distance of the HUD projection. The curved mirrors are made of plastic while the plane mirror is made of glass.

The course of projection is shown in the following illustration.

The projected HUD image content appears at a distance of approx. 2.2 m from the eye.

- 1. Head-Up Display
- 2. Windscreen
- 3. Projected image
- 4. Projection distance



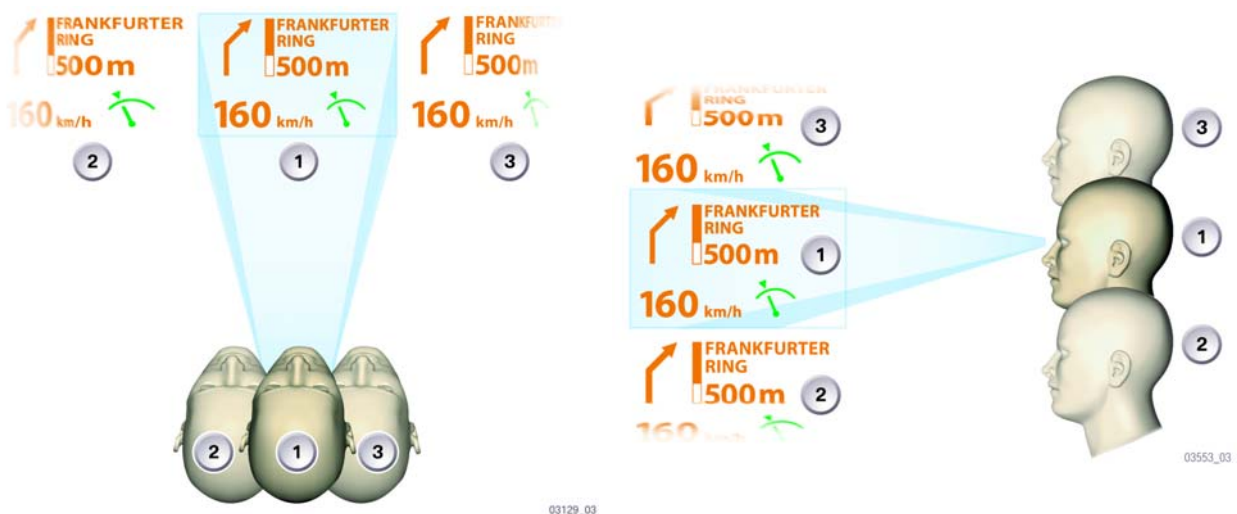
## Eyebox

The eyebox is the movement space in which the driver can move without his view of the image in the HUD being impaired.

The freedom of movement within the eyebox is roughly:

- 130 mm horizontally
- 90 mm vertically

Outside the eyebox limits the image in the HUD is no longer clearly visible.



1. Point of vision inside the eyebox HUD image OK
2. Point of vision displaced to the left HUD image distorted to the left
3. Point of vision displaced to the right HUD image distorted to the right

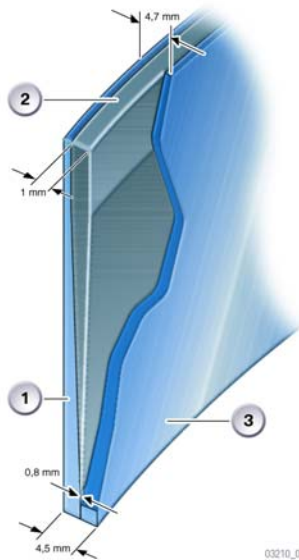
1. Point of vision inside the eyebox HUD image OK
2. Point of vision displaced downward HUD image distorted downward
3. Point of vision displaced upwards HUD image distorted upwards

## Windshield

The windshield is a "special" windshield and is an integral component vital to projecting the displays. The outer and inner glass panes are connected to a plastic film, which is wedge-shaped over the entire length of the windshield.

The wedge-shape prevents double displays (ghosts) of the HUD by positioning both images one above the other. The wedge tip points downward and starts at a distance of approx. 10 cm to the bottom edge of the windshield.

The end of the wedge is located at approx. 2/3 windshield height. In the top third of the windshield, the plastic film runs parallel to the outer and inner glass panes. The thickness of the wedge tip is 0.8 mm. The thickness of the end of the wedge is 1 mm.



1. Outer glass pane
  2. Plastic film
  3. Inner glass pane
- mm Unit of measurement in mm



HUD "double display"

If a non-specified (normal) windshield is used, the image is reflected on both the outer and inner glass panes. Overlapping causes the image to be displayed twice. The plastic wedge in the windshield places the images of the outer and inner pane over each other thus preventing double displays (ghosts).

### Color Selection

The HUD background color is transparent.

Symbols (such as e.g. warning symbols) are specified by the individual control units. This color specification is adopted for the display in the HUD.

2D symbols are used for optimum visibility and legibility.

The colors are:

- Orange as the standard color
- Red or yellow for warning messages
- Green for the setting speed

### Light Switch with Operating Unit

The HUD button is located in the operating unit. The control button is resistance-coded and routed directly to the HUD. The HUD can identify the button signals or a button fault using the resistance coding.

### Instrument-Lighting Dimmer

The dimmer setting is also used for the HUD with active headlights. The dimmer signal is emitted by the light module.

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## **Adjusting HUD Brightness**

The brightness of the HUD can be individually adjusted. The CID is the display instrument and the controller the control element for brightness adjustment.

The brightness offset is adjusted from the main menu as follows:

The main menu is activated as soon as terminal 15 is on.

- Press the controller, the "Settings" menu will appear.
- Select "Display settings" and confirm
- Select "Brightness of head-up display" and confirm
- Set brightness and confirm the entry by pressing the controller.

## **Service Information**

### **Operating-Hours Counters**

The HUD incorporates operating-hours counters for both the HUD and the LED array. When the HUD is replaced, the operating-hours counter must be initialized at 0.

### **Windshield**

Bear in mind when replacing the E60 or E63 windshield that the HUD requires a special windshield.

### **Replacing Head-Up Display**

A faulty HUD must be completely replaced. A new HUD must be adjusted once it has been installed. The CID must be removed for this adjustment work.

This adjustment is performed at a screw on the supporting tube. This screw incorporates an eccentric which serves to adjust the angle of the HUD in relation to the windshield.

A special tool is required for adjustment.

### **Test Functions**

Different functions can be selected in service without the Service Tester.

Press the HUD button for 30 s to call up the test functions. As soon as the first test function is displayed, further test functions can be called up by briefly pressing the HUD button. Press the HUD button for more than 2 s to terminate the function.

Function selection:

- Identification
- System test
- Unlocking



- Rain/light sensor
- Road speed
- Operating voltage
- Language
- Unit
- Car & key memory
- Reset.



### Image Defects

Incorrect installation of the HUD or of the windshield may result in faulty HUD projections.

The incidence of light onto the windshield or into the HUD in an inconvenient situation causes the image to fade. Excessive heat in the HUD will also cause the image to fade.





## Workshop Exercise - HUD Adjustment

*With the Instructor's assistance:*

- 1. Access the HUD test functions (with KL 15 on, depress HUD button for 30 sec). Activate the System Test as an example. To unlock the HUD (test 19) for additional tests, add the last 5 numbers of the VIN.*
- 2. Verify the vehicle is equipped with the correct windshield. Fold back the weather strip at the lower A pillar corner (base of windshield) on the passenger's side. Look for HUD identification label.*
- 3. Lower steering wheel, unclip sun visors and swivel to the side. Place a large covering over the driver's side windshield (sheet of paper). Remove the on-board monitor, position special tools (62 1 121 & 62 1 122) in place.*
- 4. Using the DISplus/GT1, perform a short test on the HUD.  
Select >Control Module Functions>Component Activation>Test Picture for Height>Activate.*

**Note: Do not activate longer than 30 minutes to avoid overheating of the HUD!**

- 5. The height adjustment is measured at the upper limit test image only. The upper limit test image must be at 215 mm +/- 5 mm. If not, use special tool 62 1 122 to release the lock nut and turn the eccentric screw until the upper limit is at the correct height. Tighten the lock nut. Deactivate Test Picture as soon as the adjustment is complete.*